

## Assignment -4

PROJECT NAME	A NOVEL METHOD FOR HANDWRITTEN DIGIT RECOGNITION SYSTEM
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### 1. Download the dataset

Dataset Downloaded and uploaded to drive <https://www.kaggle.com/code/kredy10/simple-lstm-for-text-classification/data>

### 2. Import the necessary libraries

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from keras.models import Model
from keras.layers import LSTM, Activation, Dense, Dropout, Input, Embedding
from keras.optimizers import RMSprop
from keras.preprocessing.text import Tokenizer
from keras.preprocessing import sequence
from keras.utils import pad_sequences
from keras.utils import to_categorical
from keras.callbacks import EarlyStopping
```

### 3. Read dataset and do pre-processing

#### (i) Read dataset

```
df = pd.read_csv('/content/spam.csv', delimiter=',', encoding='latin-1')
df.head()
```

	<b>v1</b>	<b>v2</b>	<b>Unnamed: 2</b>	<b>Unnamed: 3</b>	<b>Unnamed: 4</b>
<b>0</b>	ham	Go until jurong point, crazy.. Available only ...	NaN	NaN	NaN
<b>1</b>	ham	Ok lar... Joking wif u oni...	NaN	NaN	NaN
<b>2</b>	spam	Free entry in 2 a wkly comp to win FA Cup fina...	NaN	NaN	NaN
<b>3</b>	ham	U dun say so early hor... U c already then say...	NaN	NaN	NaN
<b>4</b>	ham	Nah I don't think he goes to usf, he lives aro...	NaN	NaN	NaN



## (ii) Preprocessing the dataset

```
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)
df.info()
```

```
<class 'pandas.core.frame.DataFrame'> RangeIndex:
5572 entries, 0 to 5571
Data columns (total 2 columns):
#   Column  Non-Null Count  Dtype
---  -
0    v1      5572 non-null       object
1    v2      5572 non-null       object
dtypes: object(2)
memory usage: 87.2+ KB
```

```
X = df.v2
Y = df.v1
le = LabelEncoder()
Y = le.fit_transform(Y)
Y = Y.reshape(-1,1)
```

```
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.15)
```

```
max_words = 1000
max_len = 150
tok = Tokenizer(num_words=max_words)
tok.fit_on_texts(X_train)
sequences = tok.texts_to_sequences(X_train)
sequences_matrix = pad_sequences(sequences,maxlen=max_len)
```

#### 4.5. Create model and Add Layers(LSTM ,Dense-(Hidden Layers), Output)

```
inputs = Input(name='inputs',shape=[max_len])
layer = Embedding(max_words,50,input_length=max_len)(inputs)
layer = LSTM(64)(layer)
layer = Dense(256,name='FC1')(layer)
layer = Activation('relu')(layer)
layer = Dropout(0.5)(layer)
layer = Dense(1,name='out_layer')(layer)
layer = Activation('sigmoid')(layer)
model = Model(inputs=inputs,outputs=layer)model.summary()
```

Model: "model"

Layer (type)	Output Shape	Param #
inputs (InputLayer)	[(None, 150)]	0
embedding (Embedding)	(None, 150, 50)	50000
lstm (LSTM)	(None, 64)	29440
FC1 (Dense)	(None, 256)	16640
activation (Activation)	(None, 256)	0
dropout (Dropout)	(None, 256)	0
out_layer (Dense)	(None, 1)	257
activation_1 (Activation)	(None, 1)	0
Total params: 96,337		
Trainable params: 96,337		
Non-trainable params: 0		

#### 6. Compile the model

```
model.compile(loss='binary_crossentropy',optimizer=RMSprop(),metrics=['accuracy'])
```

#### 7. Train and Fit the model

```
model.fit(sequences_matrix,Y_train,batch_size=128,epochs=10,
        validation_split=0.2)
```

Epoch 1/10

30/30 [=====] - 8s 263ms/step - loss: 0.0060 - accurac

```

Epoch 2/10
30/30 [=====] - 8s 263ms/step - loss: 0.0036 - accurac
Epoch 3/10
30/30 [=====] - 8s 263ms/step - loss: 0.0572 - accurac
Epoch 4/10
30/30 [=====] - 8s 262ms/step - loss: 0.0038 - accurac
Epoch 5/10
30/30 [=====] - 8s 261ms/step - loss: 0.0018 - accurac
Epoch 6/10
30/30 [=====] - 8s 263ms/step - loss: 0.0022 - accurac
Epoch 7/10
30/30 [=====] - 9s 310ms/step - loss: 0.0020 - accurac
Epoch 8/10
30/30 [=====] - 8s 261ms/step - loss: 0.0015 - accurac
Epoch 9/10
30/30 [=====] - 8s 264ms/step - loss: 0.0015 - accurac
Epoch 10/10
30/30 [=====] - 8s 263ms/step - loss: 0.0021 - accurac
<keras.callbacks.History at 0x7f2b60b5f110>

```

## 8. Save the model

```
model.save('sms_classifier.h5')
```

Preprocessing the Test Dataset

```

test_sequences = tok.texts_to_sequences(X_test)
test_sequences_matrix = pad_sequences(test_sequences, maxlen=max_len)

```

## 9. Testing the model

```
accr = model.evaluate(test_sequences_matrix,Y_test)
```

```
27/27 [=====] - 1s 21ms/step - loss: 0.2618 - accuracy
```

```
print('Test set\n  Loss: {:.3f}\n  Accuracy: {:.3f}'.format(accr[0],accr[1]))
```

```

Test set
  Loss: 0.262
  Accuracy: 0.977

```